

Distribution and sprainting activity of the Otter (*Lutra lutra*) in the Pollino National Park (southern Italy)

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From March 2001 to December 2002, 32 stretches (sampling stations, mean length 673 m) distributed on 17 watercourses of the Pollino National Park (southern Italy) and the surrounding area were searched monthly for otter *Lutra lutra* signs, mainly spraints. All the watercourses were positive for otter with a mean percentage of 82.2%, indicating a stable presence of otters, mainly on Sinni and Mercure-Lao catchments (central-northern part of the park). Mean sprainting activity was 12.8 sprainting sites/km and 31.7 spraints/km, and showed a seasonal variation only in 2001 with two peaks, in May-June and in October. Sprainting activity was positively correlated with the percentage of positive stretches on watercourses, confirming that spraint density can represent an indicator of the population size of otters. A preliminary evaluation of the relationship between fish availability and otter marking intensity was performed along 39 km of the River Sinni on one day. A positive correlation was found between sprainting intensity (spraints/km) and the number of suitable sites for fish, such as pools or stretches of streams with good vegetation cover. Sprainting activity seemed to be linked to the distribution of fish availability. Since the Pollino National Park occupies a strategic position within the Italian otter range, an accurate management plan is needed to improve the quality of riverine ecosystems and to conserve otters.

KEY WORDS: *Lutra lutra*, distribution, sprainting activity, southern Italy.

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INTRODUCTION

The otter *Lutra lutra*, once widespread in Europe, has declined substantially in the last few decades (CHANIN 1985), becoming limited to small areas in central-western countries (MACDONALD & MASON 1994, CONROY & CHANIN 2002). Several factors have been blamed for this trend, including human persecution, the destruction of riparian vegetation and the reduction in food supply due to various pollutants (MASON 1995, RUIZ-OLMO et al. 2002).

Monitoring of otter populations is commonly based on searches for signs of otters, such as spraints (faeces) and anal secretions, frequently deposited at prominent sites (e.g. boulders and logs). During the 1980s, a number of standardized surveys based on the recognition of field signs were carried out in Mediterranean countries in order to assess the distribution and status of otters (GREEN & GREEN 1981; MACDONALD & MASON 1982, 1983a, 1983b, 1984, 1985; ELLIOT 1983; LILES & JENKINS 1984; MACDONALD et al. 1985, 1986; CASSOLA 1986; PRIGIONI et al. 1986); Italy revealed one of the more critical situations. At present, the otter's Italian range is confined to the southern part of the peninsula with an approximate extension of 9.500 km² (C. PRIGIONI unpublished data). In recent years, some new records have been found in several tributaries of the main rivers where the otter was recorded in the 1980s. Nevertheless, this seems to be due to an increase in otter surveys rather than to an effective expansion in distribution.

The Pollino National Park covers a large part of the otter's Italian range and is a strategic area for the conservation of the species. In the present study, we report here on the distribution and marking behaviour of otters in the park and its surroundings. The otter survey was conducted throughout two years by monthly samplings in several watercourses in order to define (i) the percentage of marking, as a measure of the stable presence of otters, and (ii) the marking level as an approximate indicator of the population size of otters (MASON & MACDONALD 1987). Both parameters were considered to identify the most important areas for otters and for a preliminary evaluation of their environmental characteristics. This study is part of an otter project designed to outline a strategy for the conservation of otters and to improve riverine ecosystems.

STUDY AREA

The survey was undertaken in the Pollino National Park, the largest protected Italian area, located in southern Italy between the regions of Calabria and Basilicata. The area is about 1930 km² in size, with altitudes ranging from the 200 m a.s.l. (lower Sinni River valley) to the over 2000 m a.s.l. (Pollino massif).

The landscape is predominantly mountainous, with very little urbanisation. The climate is characterised by sharp variations of temperature that reflect the wide altitudinal range.

The following main forest or pasture habitats are recognizable. The low-elevation level is dominated by mixed sclerophyllous evergreen oak, with *Quercus ilex* associated with *Pistacia lentiscus* and *Myrtus communis*. At medium elevation, mixed deciduous forests predominate (*Q. cerris*, *Q. pubescens*, *Q. frainetto*, *Ostrya carpinifolia*, *Carpinus betulus* and *C. orientalis*). Higher elevations are characterised by forests, mainly occupied by beech (*Fagus sylvatica*) and cuirassed pine (*Pinus leucodermis*), an endemic relict species which represents the true emblem of the park. Mountain pastures are dominated by *Sesleria tenuifolia* and *Carex kitaibehiana*.

The hydrographic system is mainly represented by the River Sinni which forms a wide east-west oriented valley in the north portion of the park and flows into the Ionian Sea and by the River Mercure-Lao, which originates from the Pollino massif and runs south-westwards toward the Tyrrhenian Sea. The main water system of the park consists of 408 km of rivers and streams, of which 212 km and 73.5 km form the Sinni and Mercure-Lao catchments respectively. The hydrographic network shows a density of 0.21 km of watercourses per km².

Most streams are characterised by a torrential flow, with rapid, shallow waters. More than 60% of the stations sampled for otters (reaches of watercourse) were characterized by salmonids; cyprinids predominated in middle-low reaches of the River Sinni (PRIGIONI et al. 2003).

Water is intensively used for field irrigation in the summer. Apparently uncontrolled canalisation and embankments often deeply alter riverbeds and riparian vegetation, which, when undisturbed, is formed mainly by poplars (*Populus alba*, *P. nigra*), alder (*Alnus glutinosa*) and willows (*Salix* sp.).

METHODS

From March 2001 to December 2002, 32 reaches/sampling stations (mean length = 673 m; min-max = 300-1100; SD = 197.6) distributed along 17 watercourses of the park and its surrounding areas, were searched monthly for otter signs (mainly spraints and anal secretions). The number of sprainting sites and the number of spraints were counted. A reach of watercourse was considered negative (absence of otters) when no sign was found within it. A sprainting site was identified as a place with spraints that were at least 1 m from other ones (KRUUK et al. 1986). For each watercourse, the sprainting activity was expressed as annual mean percentage of surveys positive for otters [%P = (number of positive surveys/total number of surveys per station) × 100] and as annual mean number of spraints and annual mean number of sprainting sites per kilometre. The monthly variation in sprainting intensity (spraints/km) was evaluated for 14 watercourses regularly marked throughout the study period. The %P between the 2 years (from March to December) was compared by a chi-square test using all the data and by Fisher's Exact Test (FISHER 1935) for each watercourse; in addition, the number of spraints and the number of sprainting sites recorded for each watercourse were compared by the Mann-Whitney U test between the 2 years. The relationship between the number of spraints/sprainting sites and %P was tested by Spearman rank correlation (r_s).

In the study area, PRIGIONI et al. (2003) assessed fish density by electrofishing in stretches of watercourse picked at random inside the stations investigated for otter signs. They found a positive correlation between fish density and number of pools or water stretches covered with vegetation (mainly beds of reeds — *Typha* spp. and *Phragmites australis* — or riparian vegetation — willows and brambles — protruding over the water) and characterized by still or rather low, relatively deeper waters.

Hence, in order to perform a preliminary evaluation of the relationship between fish availability and otter marking intensity, 39 km of the River Sinni were surveyed in November 2002 in one day by eight operators, each of them monitoring a specific stretch. For each kilometre, the number of spraints and the number of suitable sites for fish were recorded. Spearman rank correlation was used for testing this relationship. In addition, the variation in number of suitable sites for fish along the River Sinni was assessed by a simple linear regression (significant level evaluated by F test).

RESULTS

During the study period, 82.2% of the stations sampled on 17 watercourses were positive for otters (Table 1). Twelve watercourses showed a %P ranging from

70% to 100%. The %P did not vary when comparing the data of 2001 with those of 2002; significant variation was only recorded for three watercourses with a decrease in Serrapotamo (100% in 2001 vs 16.7% in 2002, $P < 0.001$) and Raganello (71.4% in 2001 vs 8.3% in 2002, $P < 0.05$), and an increase in Battendiero (83.3% in 2001 vs 100% in 2002, $P < 0.05$).

The mean sprainting activity was 12.8 sprainting sites/km and 31.7 spraints/km (Table 2). The two indices were strongly correlated ($r_s = 0.98$, $P < 0.001$, $n = 17$). Sprainting activity, expressed in both ways, was positively correlated with the %P ($r_s = 0.74$, $P < 0.001$, $n = 32$, for both correlations).

Despite the high %P in the north portion of the study area, together with an intense marking activity (Fig. 1), a significant fall of spraints/km from 2001 to 2002 was observed for the River Sinni and for two main tributaries (Serrapotamo and Frido rivers; Table 3); a sharp decrease was also found in two less well marked watercourses (the S. Nocaio and Raganello rivers).

Throughout the study period, the monthly sprainting activity of otters (spraints/km) showed two peaks in 2001, in May-June and in October, and a substantial decrease in 2002 with a very small peak in March (Fig. 2). The number of otter spraints/km and the number of suitable sites for fish per km (mean = 6.6, min-max = 0-23; SD = 5.78) recorded along 39 km of the River Sinni, were positively correlated ($r_s = 0.49$, $P = 0.004$, $n = 39$, Fig. 3).

Table 1.

Watercourses surveyed for signs of otters and the percentage of surveys positive for otters (%P) during the study period.

Watercourses	Number of sampled stations	Total number of surveys	%P
Peschiera	1	21	100.0
Battendiero	3	66	100.0
Fosso Paraturo	1	4	100.0
Sinni	6	119	99.2
Abatemarco	1	20	90.0
Argentino	1	19	89.5
S. Nocaio	1	18	88.9
Mercure-Lao	4	85	88.2
Frido	3	57	86.0
Fosso Schettino	1	5	80.0
Cogliandrino	2	44	77.3
Occido	1	20	70.0
Rosa	1	20	65.0
Sammarella	1	2	50.0
Serrapotamo	3	51	41.2
Esaro	1	18	38.9
Raganello	1	20	30.0
Total	32	589	82.2

Table 2.

Mean sprainting activity for each watercourse monitored during the study period (number of surveys = 589).

Watercourses	Sprainting sites/km	Spraints/km
Sinni	26.9	68.3
Serrapotamo	1.7	2.5
Cogliandrino	10.6	18.5
Frido	10.3	17.7
Peschiera	11.2	27.0
Mercure-Lao	6.5	12.7
Battendiero	23.9	82.3
Fosso Schettino	2.0	2.6
Fosso Paraturo	3.7	4.4
Sammarella	7.1	8.6
S. Nocai	8.4	15.1
Abatemarco	4.9	9.0
Argentino	7.3	14.7
Rosa	3.2	5.4
Esaro	1.7	2.8
Occido	2.8	4.3
Raganello	11.4	27.4
Mean ± SD	12.8 ± 14.4	31.7 ± 51.3

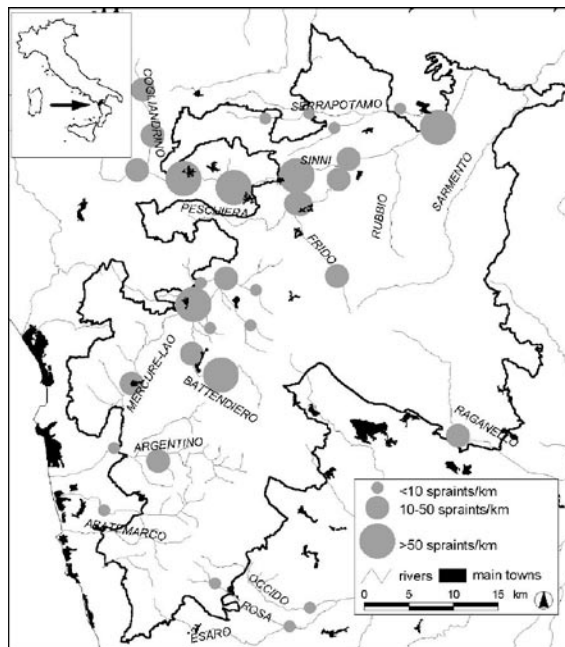


Fig. 1. — Otter sprainting activity in Pollino National Park, showing three categories of intensity (spraints/km) recorded in 32 stretches of watercourse.

Table 3.

Comparison between the mean sprinting intensity (sprints/km) recorded for 14 watercourses in the same period (March-December) of 2001 and 2002 (NS = not significant).

Watercourses	2001			2002			U	P
	n	mean	median	n	mean	median		
Sinni	48	96.1	72.2	56	46.3	41.1	955.5	0.01
Serrapotamo	20	3.2	1.2	23	2.1	0	143.5	0.02
Cogliandrino	19	22.8	21.4	19	17.0	7.1	146.5	NS
Frido	18	34.1	32.5	30	11.0	7.5	76.5	<0.001
Peschiera	8	36.2	34.4	10	22.0	9.4	17	NS
Mercure-Lao	35	13.8	8.0	39	10.6	6.7	603.5	NS
Battendiero	27	97.9	87.1	30	69.3	51.7	291	NS
S. Nocaio	5	35.6	36.0	10	8.8	7.5	9	0.05
Abatemarco	7	12.6	6.7	10	6.5	6.7	26.5	NS
Argentino	7	16.3	8.8	10	13.6	7.5	31.5	NS
Rosa	7	11.3	7.8	10	2.2	1.7	18	NS
Esaro	7	4.5	1.8	9	2.1	0	18	NS
Occido	7	6.8	6.3	10	3.6	3.7	23.5	NS
Raganello	7	73.3	23.3	10	3.5	0	13	0.03

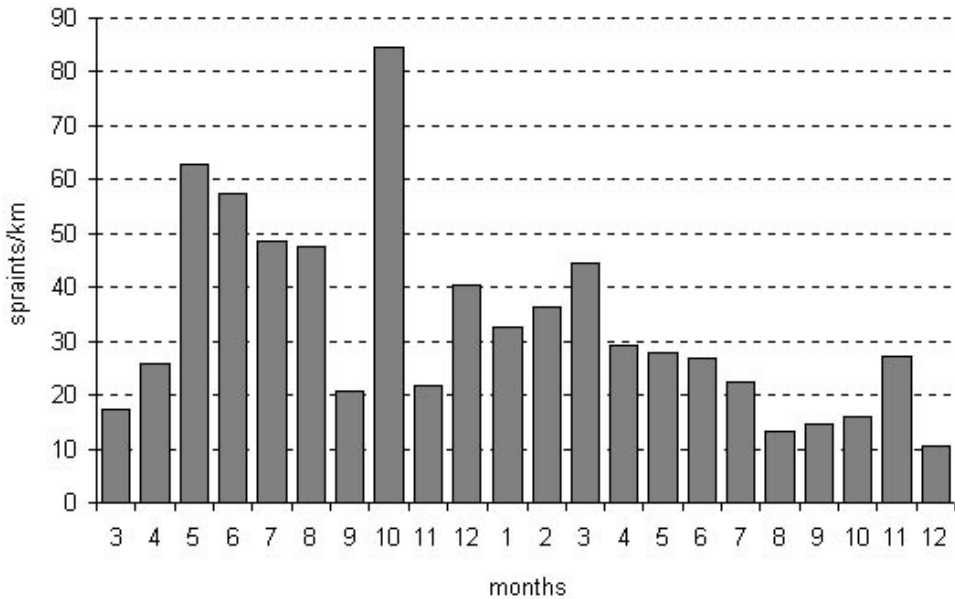


Fig. 2. — Monthly variation in the number of sprints/km from March 2001 to December 2002 (data from 14 watercourses regularly marked throughout the study period).

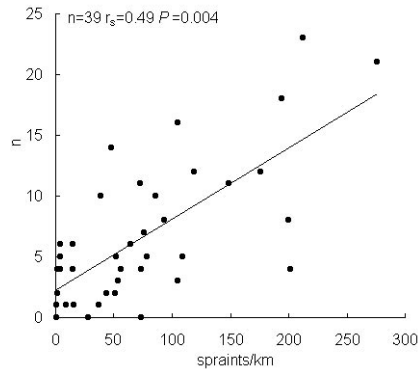


Fig. 3. — Relationship between number (n) of suitable sites for fish and the marking intensity of otters (spraints/km) recorded for 39 km of the River Sinni.

DISCUSSION

Otters are difficult to observe in their habitat, and most surveys have been carried out using spraints, which are considered indicative of the mustelid presence (MASON & MACDONALD 1986 for a review).

Many authors have discussed the reliability of the use of spraints as a survey tool, suggesting that this technique must be employed with caution, especially for assessing habitat selection (JEFFERIES 1986, KRUUK et al. 1986, KRUUK & CONROY 1987, MASON & MACDONALD 1987). However, regular monitoring of medium-large areas can allow us to broadly define the status of otter populations (MASON & MACDONALD 1987).

In our study area, the high percentage of positive stations on watercourse points to a stable presence of resident otters. Therefore, the strong correlation between sprainting intensity and percentage of positive stations confirms that spraint/sprainting site density can represent an indicator of population size of otters (JEFFERIES 1986, MASON & MACDONALD 1987). In addition, MASON & MACDONALD (2004) assessed the rate of otter population growth in some river catchments of western Britain calculating an index of otter population by combining the percentage of positive stations and the mean number of signs per sprainting site. They confirmed further that the percentage of stations positive for otters and the sprainting intensity together can be used as a measure of the performance of an otter population.

We found a higher mean sprainting activity than recorded in 1987-1991 for rivers surrounding the Pollino park, such as Agri (5.22 spraints/km) and Basento (3.34 spraints/km) (PRIGIONI & FUMAGALLI 1995). This evidence indicates that the River Sinni, characterized by a greater marking activity, is a watercourse of major importance for otters in the study area; by contrast, it was considered scarcely used by otters in the 1980s (MACDONALD & MASON 1983b, LOY & RACANA 1986).

The otter seems to be firmly present and abundant in the northern and central part of the park, where there is a good river system connected with surrounding watercourses holding viable otter populations (e.g. River Agri; PRIGIONI 1997). The River Serrapotamo, though scarcely marked by otters because of long periods with

no water, could be a corridor connecting the Sinni and Agri catchments. The southern part of the study area was less well marked by otters with rivers discontinuously used. Among these, the River Raganello, which maintains a satisfactory water level all year round, is quite isolated with respect to the main otter population of the park (Fig. 1). Probably, only roaming animals during dispersal reach it periodically, making it a suitable corridor for southwards otter expansion.

The seasonality of otter sprainting behaviour has been discussed by several authors, who formulated different interpretations, usually adapted to local situations (e.g. KRUK et al. 1986, MASON & MACDONALD 1987). In northern and central Europe marking activity is more intense from October to March and falls from June-July to September (CONROY & FRENCH 1987, MACDONALD & MASON 1987, KRANZ 1996). In the Mediterranean habitat, PRIGIONI & FUMAGALLI (1995) observed a similar trend in some rivers of southern Italy, while little evidence of seasonal peaks in marking was recorded in Spain (DELIBES et al. 1991, RUIZ-OLMO & GOSÁLBEZ 1997). In the present study, our results indicate an obvious bi-modal trend in 2001, but this was not confirmed in 2002. Variation in sprainting behaviour could be related to the reproductive cycle, with peaks of marking when cubs start to move within the family group territory (PRIGIONI et al. 1995, KRANZ 1996). Our data agree in part with this interpretation.

Sprainting activity has also been used to assess habitat selection, although this has some limitations and represents a controversial issue, which has stimulated intense discussion (KRUK et al. 1986, KRUK & CONROY 1987, MASON & MACDONALD 1987). Some authors recorded a positive correlation between marking activity and riverbank vegetation cover (MASON & MACDONALD 1985), while in other cases this relationship was not observed (e.g. LILES & JENKINS 1984). Other authors assessed the food supply for otters and concluded that fish prey availability is the main factor determining otter distribution (GREEN et al. 1984, KRUK et al. 1993, PRENDA & GRANADO-LORENCIO 1996, RUIZ-OLMO et al. 2001). Our preliminary evaluation of the relationship between spraint density and habitat features agree with this second hypothesis, showing that, to a certain extent, otter marking activity is influenced by fish availability. In the River Sinni, the number of suitable sites for fish decreased from upstream to downstream ($R^2 = 0.4$, $F = 24.4$, $P < 0.001$) with higher values along stretches characterized by a torrential flow and dominated by salmonids.

In Mediterranean catchments, characterized by high summer temperatures, drought and water extraction which further reduces river flows, fish availability seems to be related to the presence of scattered pools well covered with vegetation, which offer suitable habitats to fish and, consequently to otters. Therefore, all management actions that result in reduced diversity of aquatic habitats represent the main threat to otter conservation in the Pollino National Park. Bearing in mind the fundamental role that the park plays in the conservation of otters, lying in a strategic position for inter-population connectivity, a plan for river habitat management is urgently required (PRIGIONI et al. 2003).

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